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RPP-RPT-25529, Rev. 0

Temporary Sewage Holding Tank Engineering Report for the Integrated Disposal Facility (IDF) Mobile Restroom Trailer

Author

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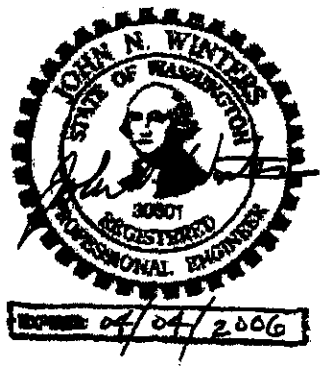

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1.0 GENERAL PLAN

This report is submitted for approval of one temporary sewage holding tank that is associated with a mobile restroom trailer. The trailer will serve the Integrated Disposal Facility (IDF) support facilities. The site is located approximately 18 miles northwest of Richland, Washington, within Benton County.

The IDF support facility is required for the IDF landfill construction, startup and related activities. This facility will provide office and workspace for the supervisors, engineers, technicians, and craft workers engaged in fieldwork. The facility, consisting of temporary, modular trailers, will accommodate the anticipated staff for approximately 10 years during construction, startup and operations activities. Existing power and raw water utilities are currently in-place to support the IDF project. A mobile restroom trailer is being added to serve the IDF support facility. The restroom trailer will discharge to a below-grade temporary sewage holding tank. Wastewater discharge from the restroom trailer is anticipated to occur during each daily shift, 5 days per week.

1.1 WATER SOURCE

A temporary, above-grade water tank will supply potable water for the restroom trailer. This potable water tank will be located within the restroom trailer and will have a capacity of 300 gallons. Potable water usage is expected to occur during each daily shift, 5 days per week. The only use of the potable water for the IDF project is the restroom trailer. The potable water tank will be refilled on a regular basis by Fluor Hanford Water Utilities staff.

1.2 WASTEWATER COLLECTION SYSTEM

Wastewater from the restroom trailer will be delivered to a holding tank by a gravity sewer pipe. The temporary sewage holding tank will be a nominal 1,500-gal, below-grade tank. A holding tank was chosen due to the temporary nature of the project and the lack of a nearby sanitary sewer collection system. The holding tank will be used through the duration of the project. At the end of the construction and operations activities, the need for continued use of the holding tank for future support of IDF activities will be evaluated. The design capacity for the holding tank system design is for a worst case population of 20 people. This size will provide adequate capacity for both the construction and operation phases of the IDF support facilities.

2.0 WASTEWATER STORAGE TANK LOCATION

2.1 LOCATION, LAND USE, AND CLIMATE

The proposed temporary sewage holding tank will be located on the U.S. Department of Energy's Hanford Site in the 200 East Area within the Hanford Site Boundary. The IDF project site is 168 acres located southwest of the PUREX plant. It is bounded on the south by 1st Street and on the north by 4th Street. The proposed location of the holding tank is within the northern third of the IDF project and is shown in Figure A-1 in Appendix A. The mobile restroom trailer will be sited 300 feet to north of the IDF landfill liner edge. This location shall be in compliance with the state waste discharge permit number ST 4511. The IDF site is located on a plateau above the Columbia River. The river runs generally to the east and swings around the site, lying approximately 8 miles northwest and northeast of the 200 East Area.

The site land use of the IDF support facilities area and nearby area is dedicated to construction and operations.

The climate is semi-arid, with an annual average precipitation of 6.98 in. The lowest temperature recorded on the Hanford Site is -23°F, while the highest temperature recorded is 112°F (Hoitink).

2.2 GEOLOGY AND FLOODING POTENTIAL

The IDF site is located south of the Gable Mountain segment of the Umtanum Ridge anticline and about 1.86 miles north of the axis of the Cold Creek syncline, that controls the structural grain of the basalt bedrock and the Ringold Formation. The basalt surface and Ringold Formation trend roughly southeast-northwest parallel to the major geologic structures of the site. As a result, the Ringold Formation and the underlying Columbia River Basalt Group gently dip to the south off the Umtanum Ridge anticline into the Cold Creek syncline.

Geologic mapping on the Hanford Site and examination of drill core and borehole cuttings in the area have not identified any faults in the vicinity of the IDF site (DOE/RW-0164).

The project area is significantly higher than the Columbia River and is not in the river's floodplain. The soils in the project area are sandy with high rates of infiltration. Most of the precipitation falling on the site infiltrates into the ground, and there are no significant long-term surface water features in the project area.

3.0 DESIGN CRITERIA

3.1 TEMPORARY SEWAGE HOLDING TANK

All sewage generated from the restroom trailer will be collected in the proposed nominal 1,500 gallon temporary sewage holding tank. The tank is sized based on pump out service every 7 days (5 working days). This pump-out frequency meets the design calculation assumptions. The tank will include a level alarm system as required by Washington State Department of Health standards. Pump out access will be provided by a vertical pipe at one of the access ports. This pipe extends to within several inches of the tank bottom. The holding tank shall be vented back through the restroom trailer's sewer drainpipe to the restroom trailer to ensure proper venting of potential nuisance odors.

3.2 QUALITY ASSURANCE

The proposed system will be installed in accordance with the technical specifications included in Appendix A.

4.0 OPERATION AND MAINTENANCE

An operations and maintenance manual has been prepared that specifies inspection and pumping requirements. The manual also provides specific inspection recommendations.

5.0 REFERENCES

Hoitink, D. J., J. V. Ramsdell, K. W. Burk, and W. J. Shaw, 2004, *Hanford Site Climatological Data Summary 2003 with Historical Data*, PNNL-14616, Pacific Northwest National Laboratory, Richland, Washington.

State Waste Discharge Permit Number ST 4511, State of Washington Department of Ecology Richland, Washington

6.0 BIBLIOGRAPHY

WDOH, 1999, *Holding Tank Sewage Systems, Recommended Standards and Guidance for Performance, Application, Design and Operation & Maintenance*, Washington State Department of Health, Olympia, Washington.

WAC 51-26, "Uniform Plumbing Code," *Washington Administrative Code*, as amended.

WAC 246-272, "On-Site Sewage Systems," *Washington Administrative Code*, as amended.

APPENDIX A

TECHNICAL SPECIFICATION FOR TEMPORARY SEWAGE HOLDING TANK AND INSTALLATION

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APPENDIX A
TECHNICAL SPECIFICATION
FOR TEMPORARY SEWAGE HOLDING TANK AND INSTALLATION

A.1 GENERAL

A.1.1 Summary

This specification establishes the quality of materials and workmanship and defines the quality measures for providing and installing a single compartment, nominal 1,500-gal temporary sewage holding tank complete with a level alarm system.

A.1.2 Abbreviations

The abbreviations listed below, used in this specification, shall have the following meanings:

AC	alternating current
ASTM	American Society for Testing and Materials
NEC	*National Electric Code*
NEMA	National Electrical Manufacturers' Association
NFPA	National Fire Protection Association
NRTL	Nationally Recognized Testing Laboratory
PVC	polyvinyl chloride
UL	Underwriters' Laboratories
UPC	*Uniform Plumbing Code*
WAC	*Washington Administrative Code*

A.1.3 Codes, Standards, Laws, and Regulations

Unless otherwise approved or shown, the following codes, standards, laws, and regulations of the latest issue at the time of bid shall apply to establish the minimum requirements for installation of the holding tanks. Referenced test methods, specifications, and recommended practices are used to verify material properties and identify acceptable practices. Failure to identify applicable codes and standards does not imply elimination of required knowledge and compliance to perform work.

ASTM D1785	*Standard Specification for Polyvinyl Chloride (PVC) Plastic Pipe, Schedules 40, 80, and 120*
ASTM D2665	*Standard Specification for Polyvinyl Chloride (PVC) Plastic Drain, Waste and Vent Pipe and Fittings*

UPC	Uniform Plumbing Code
WAC 246-272	"On-Site Sewage Disposal"

A.2 MATERIALS AND EQUIPMENT

The holding tank shall be a nominal 1,500-gallon, tank that is a single-compartment concrete holding tank as manufactured by Wilbert Precast Inc. Spokane, Washington. Other 1,500-gallon capacity tanks listed on the Washington State Department of Health's List of Approved System and Products may be submitted for review. The holding tank shall include an access riser and a pumping access riser both provided with removable covers. The tank shall include a level alarm system as specified in Section A.2.1.

A 4-inch diameter, PVC pipe shall be installed between the temporary sewage-holding tank and the trailer sewer drain stubout. The PVC piping shall conform to ASTM D2665.

Adhesive for joining the holding tank and access risers shall be IPS "Weld-On 810," a two-part plastic resin suitable for loose-fitting joints with gaps, or as recommended by the tank manufacturer to provide a watertight seal.

Bedding and backfill material for the holding tank and PVC piping shall be ¾-inch, minus crushed rock.

Concrete for the washdown pad and the bollards shall have a minimum 28-day compressive strength of 3,000 psi.

Bollards shall be 6-ft by 4-in Schedule 40 steel pipe, painted yellow.

All materials used for installation shall be suitable for outdoor and/or underground service.

A.2.1 Fabricated Control Panel – Holding Tank Level Alarm System

Provide all materials, equipment, wiring, conduits, equipment supports, and installation tools necessary for a complete system installation of the holding tank level alarm system.

The control panel and materials manufactured within the scope of UL or another NRTL shall conform to UL or NRTL standards and have an applied UL or NRTL listing mark. References to UL throughout this section imply conformity with UL or NRTL standards and guidelines.

The control panel shall be manufactured, assembled, tested, approved, and clearly labeled in accordance with UL 508A, or another inspection agency recognized by the State of Washington prior to delivery to construction site.

In addition, electrical enclosures and materials installed shall be approved for the area of classification in accordance with NFPA 820, *Fire Protection in Wastewater Treatment and Collection Facilities*; and NEC Articles 500 and 501.

A.2.1.1 Submittals. Provide a submittal for review and approval of all the major components of the tank level alarm system. Fabrication of the panel shall not begin until the submittal is approved. Submittals shall be submitted to CH2M Hill Hanford Group in accordance with the subcontractor submittal requirements. Submittals that do not meet the project requirements shall be rejected. Rejected submittals shall be resubmitted in a timely manner to avoid delays. The submittal shall include, but are not limited to, data sheets and/or catalog sheets for the following items:

- One-line diagram and control diagram
- Control panel enclosure
- Control panel fabrication drawings with details on all relays, terminal blocks, conductors, and grounding
- Float switches
- Intrinsic safety barriers for float switch termination
- Power disconnect switch
- Warning light
- Hand switches and indicator lights

A.2.1.2 Control Panel Enclosure. The control panel enclosure shall be a NEMA Standard 250, Type 4 panel with manufacturer's standard finish interior and exterior. Panel metal thickness shall be 14-gauge minimum. Panel door shall have stainless steel, quick-release clamps and allow for front access. All panel cutouts shall be cut, punched, or drilled and finished smoothly with rounded edges. Penetrations and devices mounted on the electrical panels shall have the same rating or should be mounted such that the panel's NEMA rating is maintained. Panels shall be as manufactured by Hoffman or H.F. Cox, or approved equivalent.

A.2.1.3 Control Panel - Special Construction Requirements. The level alarm control panel shall have an alarm horn, a warning light, an acknowledge button, a reset button, and status lights for each of the two float switches. Below the status lights, provide three labels as follows: the first label shall read "NORMAL OPERATIONS VOLUME – HIGH LEVEL ALARM," the second label shall read "RESERVE STORAGE VOLUME – HIGH-HIGH LEVEL ALARM." and the third label shall read "IF HORN SOUNDS, OR WARNING LIGHT IS ACTIVE, OR STATUS LIGHT IS ILLUMINATED, CONTACT SHIFT OPERATIONS AT

(phone number TBD by CHG project team).See Section A.2.1.7, "Level Alarm System Operation," for the required functionality of these components.

Provide and install intrinsic safety barriers between the hazardous area (i.e., sewage holding tank) and the safe area (i.e., control panel). Use intrinsically safe relays to monitor discrete signals (float switches status) that originate in hazardous area and are used in a safe area. Relays shall be as manufactured by MTL, Inc.; Series MTL 2000, or approved equivalent.

Provide and install conduit seals for the conduits that carry the float switch cables.

A.2.1.4 Alarm Horn. The alarm horn shall have a sound output level of 100 decibels nominal at 10 ft. The horn shall have a stainless-steel diaphragm. The horn shall have a NEMA 4X enclosure and use a 120-volt AC power supply. Penetrations and devices mounted on the enclosure shall have the same rating or should be mounted such that the panel's NEMA rating is maintained. The alarm horn shall be Model 350WB, as manufactured by Federal Signal Corp, or approved equivalent.

A.2.1.5 Level Switches. Level switches shall be direct acting float type with enclosed mercury switch and integral cable. The float shall be a 4.5-inch-diameter polypropylene body with a 1-inch maximum differential between its open and closed position. Switch contact shall be an isolated type rated for 4.5 amps continuous at 120 volts AC. Provide mounting pipe with corrosion proof hardware to mount level switches within sewage holding tank. Level switches shall be as manufactured by Anchor Scientific; Roto-Float, Type P/Type S, or approved equivalent.

A.2.1.6 Warning Light. The warning light for mounting on top of the level control panel shall be a rotating reflector or flashing bulb type (90 flashes per minute). Light shall be designed for exterior service and shall have an amber polycarbonate dome. The lamp shall be a 25-watt incandescent type. The warning light shall be as manufactured by Federal Signal, Model 225, or approved equivalent.

A.2.1.7 Level Alarm System Operation. Assemble the control panel to provide alarms based upon high-level and high-high-level float switch actuation inside the sewage storage tank as a means of monitoring liquid levels in the tank. Provide interface devices enabling an operator to acknowledge, silence, and reset high-level and high-high-level alarm conditions at the control panel assembly.

Assemble controls so, in the event the high-level float switch is actuated, the high-level alarm status light shall illuminate, as well as a warning light on top of the panel, and the alarm horn shall sound. The operator shall acknowledge high-level alarm condition at the control panel assembly. Once acknowledged, the alarm horn shall silence and the warning light will de-energize, but the high-level alarm status light shall remain lighted. In the event the high-high-level float switch is actuated, the high-high-level alarm light shall illuminate, the alarm light shall energize, and the alarm horn shall sound. The operator shall acknowledge the high-high-level alarm condition at the control panel assembly. Once acknowledged, the alarm horn shall silence and the warning light shall de-energize, but the high-high-level alarm status light shall

remain lighted. The alarm status lights shall remain illuminated until respective level float switches are de-actuated and alarm conditions are reset at the control panel assembly. Float switches will only be deactivated by removing liquid from the holding tank below the float switch set points.

A.2.2 Tank Pump-out Assembly.

The holding tank shall include a connection pipe for pump-truck hookup. This hookup is shown in Figure A-2. The assembly shall include a 3-inch diameter Schedule 40 PVC pipe with a 90-degree elbow, a galvanized steel riser clamp, and a 3-inch female cam-coupler and matching plug. The cam-coupler and plug shall be Harrington DPVC-030 and DPPP-030, respectively, or approved equivalent. The plug shall be attached to the cam-coupler with a lanyard (Harrington V20207 or approved equivalent).

A.3 EXECUTION

A.3.1 Installation Requirements

The holding tank shall be located within the IDF support facilities area and configured as generally depicted in Figure A-1.

Excavation for the holding tank shall allow for a minimum bedding depth of 6 inches, as shown in Figure A-2. Bedding material shall be placed, leveled, and compacted prior to installing the tank.

Prior to installing the access risers, a check fit of the riser to the receiving collar shall be performed to ensure proper seating and insertion.

Cement access riser components or otherwise seal the joints in accordance with manufacturer's recommendations. All joints shall be watertight.

The holding tank shall be installed so the cover for the access riser is flush with the washdown pad. The holding tank shall be installed with a minimum cover of 12 inches. Of this cover, a minimum of 6 inches of bedding material shall be used on top of the tank, with the balance provided by previously excavated material 2 inch or smaller. Backfill shall be compacted in 12-inch lifts using a hand-guided tamper and making a minimum of two complete passes over the entire exposed surface. Backfill material shall be placed uniformly around the holding tank, and each lift shall be completely compacted prior to placing the next lift.

The washdown concrete pad shall be installed on top of the temporary sewage holding tank, as shown in Figure A-2.

Excavation for the PVC service connection piping shall allow for a minimum bedding depth of 4 inches and shall have a minimum cover of 12 inches.

The PVC piping from the temporary sewage holding tank to the mobile restroom trailer stub down shall be connected with a minimum slope of 1/4 in/ft. Prior to backfilling, the drain shall be filled with water and visually inspected for leaks.

A.3.2 Holding Tank Alarm System Installation

A.3.2.1 Control Panel Installation. The level alarm system control panel installation shall be completed in accordance with NEC and applicable local electrical codes. In addition, the panel shall be located a minimum of 10 ft away from either access hatch to the sewage holding tank. The panel shall be securely mounted to an adjacent structure or stanchion mounted using Unistrut-type channels. Power from the control panel shall be extended from the trailer and be provided with a local disconnect switch, which is mounted with the control panel. The disconnect switch shall be mounted in a NEMA 4 enclosure. Power and level switch conductors, either buried or exposed, shall be installed inside conduit. Direct burial of cable shall not be acceptable.

Provide conduit seals for each conduit between the sewage storage tank and the alarm system control panel in accordance with the requirements of NEC Articles 500 and 501. Conduit seals, when properly installed, will prevent movement of potential Class 1, Groups B, C, and D gases between the storage tank headspace and the control panel.

A.3.2.2 Float Switch Installation. Install float switches to actuate the high-level alarm (associated with normal operations volume) when the tank contents is at a level equal to 890 gallons (plus or minus 2 percent). The second float switch shall be installed to actuate the high-high-level alarm at a tank level that equals a total liquid volume of 1,430 gallons (plus or minus 2 percent). The high-high-level represents approximately the sum of the estimated normal operations volume and the reserve storage volume. The float switches shall be installed using manufacturer-supplied hardware and shall be positioned so the floats can be reached from a position outside of the tank through the tank's access riser.

The steel bollards shall be installed surrounding the storage tank installation as shown in Figure A-1.

A.3.3 Tank Pump-out Assembly Installation.

The holding tank supplier shall install the tank pump-out assembly as shown in Figure A-2. A 4-inch diameter hole shall be drilled in the center of the 24-inch diameter riser lid at the end of the tank opposite the inlet. Seal the annular space between the pipe and riser lid with exterior grade silicone caulk. The 3-inch PVC pipe shall be inserted into the hole so that the bottom of the pipe is approximately 6 inches above the bottom of the tank. Install the riser clamp on the pipe, just above the lid, to hold the pipe in position. A 3-inch female cam-type coupler and plug shall be installed on end of pipe as shown on Figure A-2, above lid approximately 2-3 feet above the ground surface. The plug shall be attached to the coupler with a lanyard.

A.3.4 Testing and Certification

Following tank and level alarm panel installation, the tank level float switches shall be hand-activated to test audible and visual alarms.

Prior to backfilling, all sewer drain piping shall be leak tested with water at a minimum head of 10 ft for 1 hour. There shall be no visible leaks during the test.

A.3.5 Quality Assurance/Quality Control

All activities related to holding tank installation shall conform to stated quality, technical, and performance objectives.

A.4 REFERENCES

ASTM D1785, *Standard Specification for Polyvinyl Chloride (PVC) Plastic Pipe, Schedules 40, 80, and 120*, American Society for Testing and Materials, West Conshohocken, Pennsylvania.

ASTM D2665, *Standard Specification for Polyvinyl Chloride (PVC) Plastic Drain, Waste and Vent Pipe and Fittings*, American Society for Testing and Materials, West Conshohocken, Pennsylvania.

National Electrical Code, National Fire Protection Association, Quincy, Massachusetts.

NFPA 820, *Fire Protection in Wastewater Treatment and Collection Facilities*, National Fire Protection Association, Quincy, Massachusetts.

State Waste Discharge Permit Number ST 4511, State of Washington Department of Ecology Richland, Washington

Uniform Plumbing Code, International Association of Plumbing and Mechanical Officials, Northwest Regional Office, Walnut, California.

WAC 246-272, "On-Site Sewage Systems," *Washington Administrative Code*, as amended.

Washington Department of Health, Wastewater Management Program, List of Approved Systems and Products, January 2003

Figure A-1. IDF Mobile Restroom Facilities – Site Map.

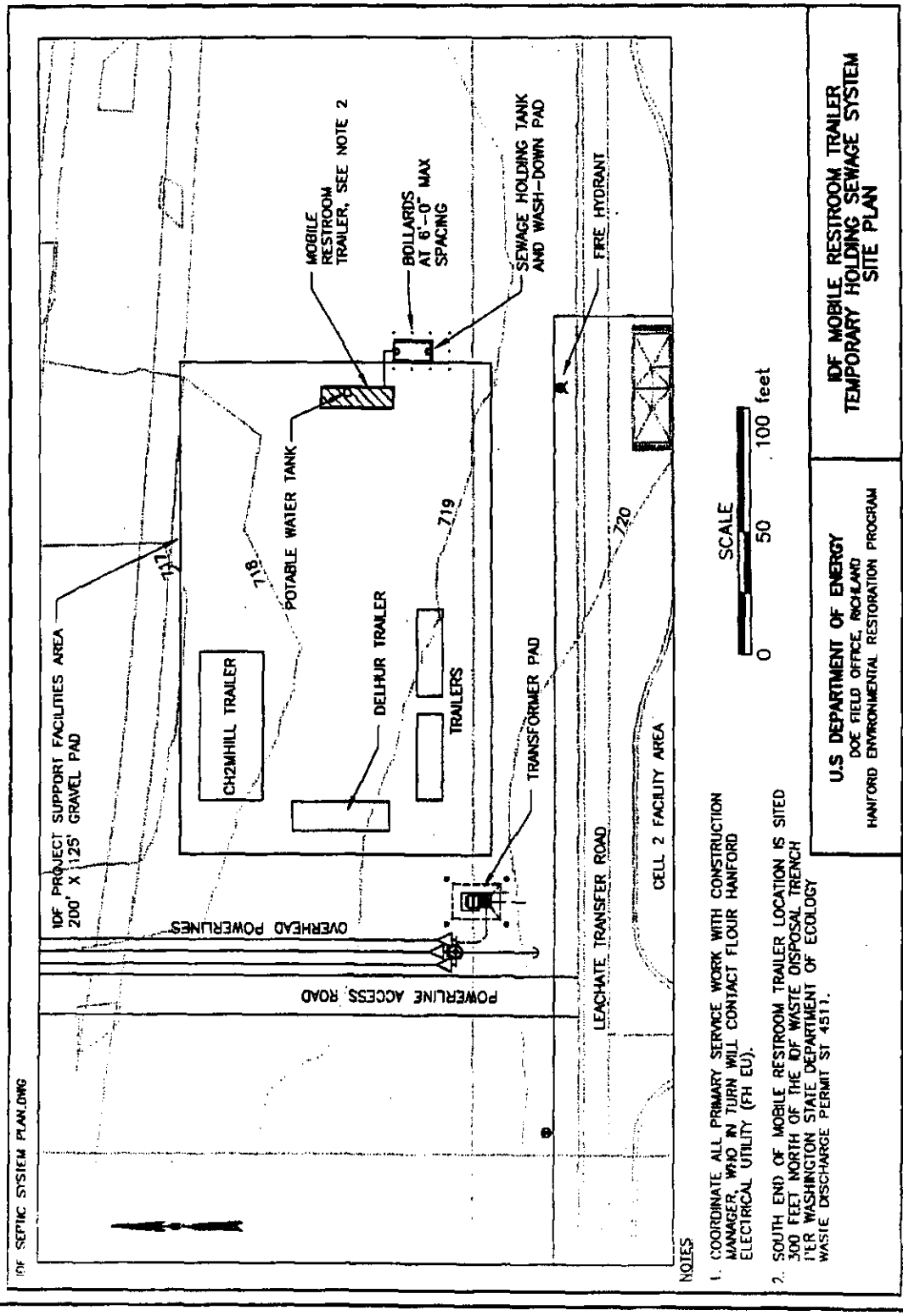


Figure A-2. IDF Mobile Restroom Facilities – Holding Tank Section.

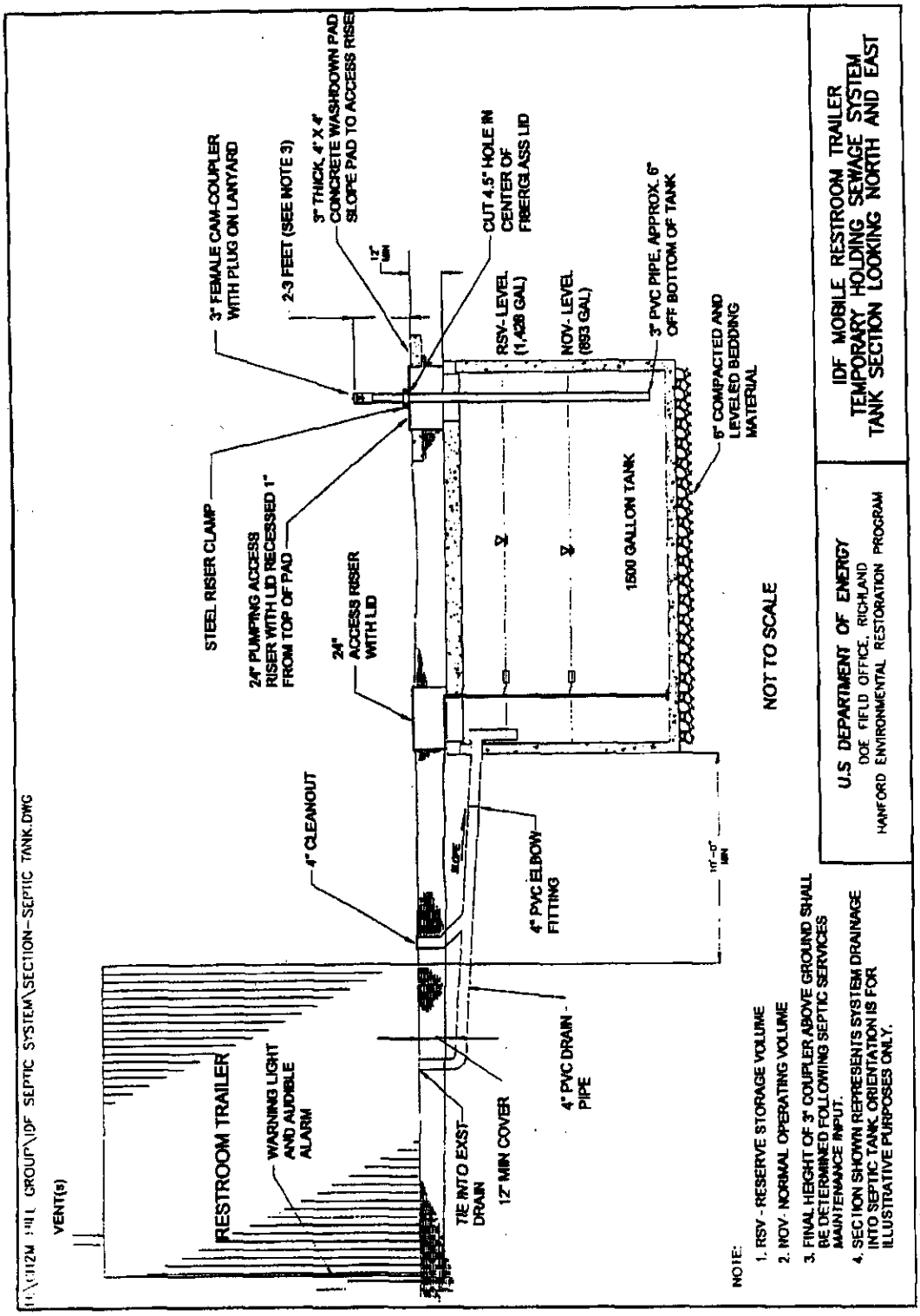
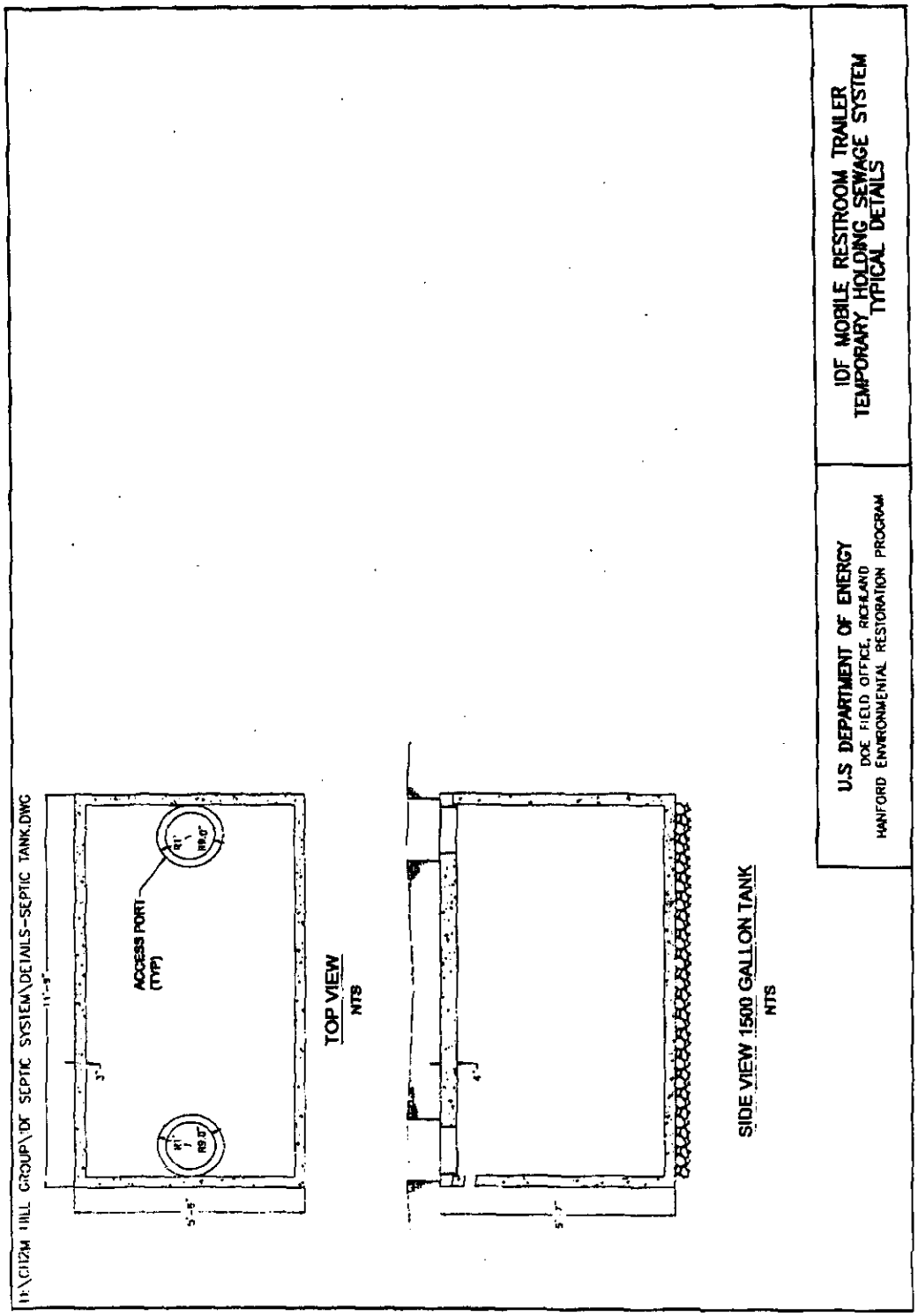


Figure A-3. IDF Mobile Restroom Facilities – Holding Tank Details.



APPENDIX B

DESIGN CALCULATION

Page 1 of 7

Title: IDF Holding Tank Sewage System Calculation Identifier: N/A Rev: 0

Originator: CA Bentz CAB Date: 3/1/05

Checker: JN Winters JNW DC Comstock DCC 4/12/05 Date: 3/31/05

Subcontractor Calculation Review Checklist

The subject document has been reviewed by the undersigned.

The checker reviewed and verified the following items as applicable.

Documents Reviewed: RPP-RPT-25529 and RPP-RPT-25530

Analysis Performed By: CA Bentz CAB

- Design Input
- Basic Assumptions
- Approach/Design Methodology
- Consistency with item or document supported by the calculation
- Conclusion/Results Interpretation

Checker (printed name, signature, and date) David Comstock DCC 4/12/05 / John Winters JNW 4/4/05 (Date)

Organizational Manager (printed name, signature and date) S.L. Bay SLB 4/13/05

Title: IDF Holding Tank Sewage System Calculation Identifier: N/A Rev: 0

Originator: CA Bentz Date: 3/1/05

Checker: JN Winters DC Comstock DCC Date: 3/31/05
4/12/05

Calculation Review Checklist

Calculation Reviewed: IDF Holding Tank Sewage System Calculation

Scope of Review: RPP-RPT-25529 and RPP-RPT-25530

(e.g., document section or portion of calculation)

Engineer/Analyst: David Comstock the responsible Engineer has signed as checker for this document. DCC 4/14/05 Date:

Organizational Mgr: Date: 4/13/05

This document consists of 7 pages and the following attachments (if applicable):

	Pages	Description
Calculation	1 through 7 Total: 7	Calculation Description and Results

Yes	No	NA*		
☑	[ ]	[ ]	1.	Analytical and technical approaches and results are reasonable and appropriate.
☑	[ ]	[ ]	2.	Necessary assumptions are reasonable, explicitly stated, and supported.
[ ]	[ ]	☑	3.	Ensure calculations that use software include a paper printout, microfiche, CD ROM, or other electronic file of the input data and identification to the computer codes and versions used, or provide alternate documentation to uniquely and clearly identify the exact coding and execution process.
☑	[ ]	[ ]	4.	Input data were checked for consistency with original source information.
☑	[ ]	[ ]	5.	For both qualitative and quantitative data, uncertainties are recognized and discussed.
☑	[ ]	[ ]	6.	Mathematical derivations were checked including dimensional consistency of results.

Title: IDF Holding Tank Sewage System Calculation Identifier: N/A Rev: 0

Originator: CA Bentz CAB Date: 3/1/05

Checker: JN Winters JNW DC Comstock DCC 5/24/05 Date: 3/31/05

☑	[ ]	[ ]	7.	Calculations are sufficiently detailed such that a technically qualified person can understand the analysis without requiring outside information.
[ ]	[ ]	☑	8.	Software verification and validation are addressed adequately.
☑	[ ]	[ ]	9.	Limits/criteria/guidelines applied to the analysis results are appropriate and referenced. Limits/criteria/guidelines were checked against references.
☑	[ ]	[ ]	10.	Conclusions are consistent with analytical results and applicable limits.
☑	[ ]	[ ]	11.	Results and conclusions address all points in the purpose.
☑	[ ]	[ ]	12.	Referenced documents are retrievable or otherwise available.
☑	[ ]	[ ]	13.	The version or revision of each reference is cited.
☑	[ ]	[ ]	14.	The document was prepared in accordance with Attachment A, "Calculation Format and Preparation Instructions."
☑	[ ]	[ ]	15.	All checker comments have been dispositioned and the design media matches the calculations.

David Comstock DCC 5/24/05

Checker (Printed Name and Signature) Date

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Title: IDF Holding Tank Sewage System Calculation Identifier: N/A Rev: 0

Originator: CA Bentz CAB Date: 3/1/05

Checker: JN Winters JNW DCComstock DCC 5/18/05 Date: 3/31/05

1. Title and Identifier

Title: IDF Holding Tank Sewage System Calculation
Identifier:

2. Objective/Purpose

Determine the technical basis for sizing the Holding Tank Sewage System for the mobile restroom trailer.

3. Input Data

Design occupancy will be for a total of 20 people including craft and/or office workers.

Using the State of Washington's maximum of 1.6 gallon/flush for toilets and 3.8 liters (1.0 gallon) flush for urinals. Assume a worst case of 1.6 gallon/flush for both toilets and urinals.

A 300 gallon potable water tank will be provided for restroom hand washing and other sanitary water needs. The faucets will be rated at 2.5 gallons per minute. For this analysis we have assumed that the typical time spent washing hands is approximately 15 seconds per individual per restroom visit. This occurs an estimated every 2 hours per individual so that an individual will visit the lavatory trailer 4 times per work shift.

4. Assumptions

The input data does not include any portable restroom facilities use, which would decrease the system loading to the holding tank.

5. Method of Analysis

Number of people = 20

Visits per day = 4

Volume/flush = 1.6 gallons

Faucet Rating = 2.5 gallons per minute

Time/Wash = 15 seconds

Volume/Wash = 0.63 gallons

Title: IDF Holding Tank Sewage System Calculation Identifier: N/A Rev: 0

Originator: CA Bentz CAB Date: 3/1/05

Checker: JN Winters JNW DConstock DCC 5/24/05 Date: 3/31/05

Option #1 (3 Day Pump Frequency Operation)

Daily Sewage Flow (DSF) = Flush + Hand Wash Flows
(People x Visits x Flush) = 128 gallons

(People x Visits x Wash) = 50.4 gallons
DSF = 178.4 gallons per day

Pump Service Frequency (PSF)
PSF = 3 working days for Option #1

Normal Operations Volume (NOV) = (DSF x PSF) = 535.2 gallons

Reserve Storage Volume* (RSV) = 3 x DSF = 535.2 gallons
* Required per WAC guidelines

Total Liquid Volume Capacity (TLVC)
(NOV + RSV) = 1070.4 gallons for Option #1

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Title: IDF Holding Tank Sewage System Calculation Identifier: N/A Rev: 0

Originator: CA Bentz CAB Date: 3/1/05

Checker: JN Winters JNW DC Comstock DCC 5/24/05 Date: 3/31/05

Option #2 (5 Day Pump Frequency Operation)

Daily Sewage Flow (DSF) = Flush + Hand Wash Flows
(People x Visits x Flush) = 128 gallons

(People x Visits x Wash) = 50.4 gallons
DSF = 178.4 gallons per day

Pump Service Frequency (PSF)
PSF = 5 working days for Option #2

Normal Operations Volume (NOV) = (DSF x PSF) = 892 gallons

Reserve Storage Volume* (RSV) = 3 x DSF = 535.2 gallons
* Required per WAC guidelines

Total Liquid Volume Capacity (TLVC)
(NOV + RSV) = 1427.2 gallons for Option #2

6. Results

It is determined that the Holding Tank Sewage System will store the weekly Normal Operation Volume and the Reserve Storage Volume equal to (Option # 1, 1070.4 gallons of liquid) and (Option #2, 1427.2 gallons of liquid). This liquid will be pumped on a weekly basis.

7. Conclusions

A state approved 1,200 gallon tank would be required for Option #1 while a 1,500 gallon tank would be required for Option #2.

Title: IDF Holding Tank Sewage System Calculation Identifier: N/A Rev: 0

Originator: CA Bentz Date: 3/1/05

Checker: JN Winters DC Comstock 5/24/05 Date: 3/31/05

8. References

Modern Building Systems, Inc. 8'x30' Mobile Restroom Drawing 2004-KM-49, Sheet 19. Used for plumbing fixture flow rates.

Holding Tank Sewage Systems.
Recommended Standards and Guidelines for Performance, Application, Design and Operation & Maintenance. Washington State Department of Health.
Effective date: April 5th, 1999.